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(54) **Disc brake**

Scheibenbremse

Frein à disque

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(56) References cited:
GB-A- 905 797
GB-A- 1 173 410

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tudinal centerline, so that the average length of moment arm remains unchanged form the time when the inner pad is brand-new until it is completely worn out. This minimizes fluctuation in torque.

[0016] Other features and objects of the present invention will become apparent from the following description made with reference to the accompanying drawings, in which:

Fig. 1A is a plan view of an embodiment of a disc brake of the present invention;
Fig. 1B is view of the same as seen from its outer side;
Fig. 2 is a perspective view of a torque-carrying plate embodying the invention;
Fig. 3A is a view of the same as seen in the direction of arrow A in Fig. 2;
Fig. 3B shows the shape of a different torque-carrying surface; and
Fig. 4 is a partial plan view of the disc brake according to the present invention.

[0017] Referring first to Fig. 1, the disc brake according to the present invention has a torque-carrying plate 1 formed by blanking a steel plate. This plate 1, which will be discussed later, is the point of the present invention.

[0018] The disc brake has a caliper 2 supported on a guide pin 3 fixed to the torque-carrying plate 1 so as to be slidable axially of the disc D. Pads 4 and 5 are provided opposite to each other on both sides of the disc D. They are hung on pad pins 6 axially extending through a window of the caliper 2 at the outer circumference of the disc D.

[0019] The inner pad 4, adapted to be biased by a brake piston 7, can slightly move in a tangential direction of the disc D, not restrained by the pad pins 6. During braking, its backing plate 4a abuts torque-carrying surfaces 1a of the torque-carrying plate 1.

[0020] The outer pad 5 has a backing plate 5a received in the window of the caliper 2 so that the torque produced during braking is carried by the caliper 2.

[0021] As shown in Figs. 2 and 3, the torque-carrying surface 1a of the torque-carrying plate 1 is not straight but has a zigzag section, so that their (axial) width W is larger than the thickness w of the torque-carrying plate 1 (Fig. 3A). This zigzag pattern is formed by inwardly protruding portions 8.

[0022] The inwardly protruding portions 8 may be formed by half-shearing or by ordinary pressing. The protrusions 8 shown in Figs. 2 and 3A are formed by the former method, while those shown in Fig. 3B are formed by the latter method.

[0023] As shown in Figs. 3A and 3B, the torque-carrying surface 1a is symmetrical with respect to a centerline C that divides the surface (L in length) into the inner half portion (near the center of the disc; L/2 in length) and the outer half portion (near the circumference of the disc; L/2 in length).

[0024] Since the torque-carrying plate 1 has the torque-carrying surface 1a having a width substantially larger than the thickness of the plate 1 itself, it can support the inner pad until it is completely worn out even if it is thinner than the value determined by conventional standards. Since the surface 1a is symmetrical with respect to centerline C, the center of the surface on which the torque is actually applied is always on the centerline C, from the time when the inner pad is brand-new until it is completely worn out (in Fig. 4 from the solid line to the dotted line). Namely, the average length of moment arm remains unchanged and the torque does not change.

[0025] It is possible to omit the pad pins 6 by engaging the inner pad in a guide groove formed in the torque-carrying plate in the axial direction of the disc. But forming such a guide groove in the thin torque-carrying plate is not only difficult but will reduce the effective area of the torque-carrying surface and thus reduce reliability and durability of the brake. Thus, it is preferable to hang the pads on the pad pins.

Claims

1. A disc brake comprising a disc (D), a brake piston (7), an inner pad (4) and an outer pad (5) disposed opposite to each other on both sides of said disc (D) and dapted to be brought into frictional contact with said disc, and a fixed torque-carrying plate (1), characterized in that

   said outer pad (5) is fixed to the outer portion of the caliper (2) to bear the load applied to said outer pad (5) on the caliper (2) and that said torque-carrying plate (1) bears only the load applied to said inner pad (4),
   that said inner pad (4) abuts said torque-carrying plate (1) when it is urged by said brake piston (7),
   that said torque-carrying plate (1) is adapted to carry brake torque applied to said inner pad (4),
   that said torque-carrying plate (1) has a torque-carrying surface of a zigzag shape comprising a plurality of protrusions (8) extending in the axial direction of said disc (D) so as to increase the width of said torque-carrying surface to such an extent that said inner pad (4) can be supported on said torque-carrying surface even when said inner pad (4) has been completely worn out, and
   that said torque-carrying surface is symmetrical with respect to a longitudinal centerline (C) of said torque-carrying surface.

FIG. 1A

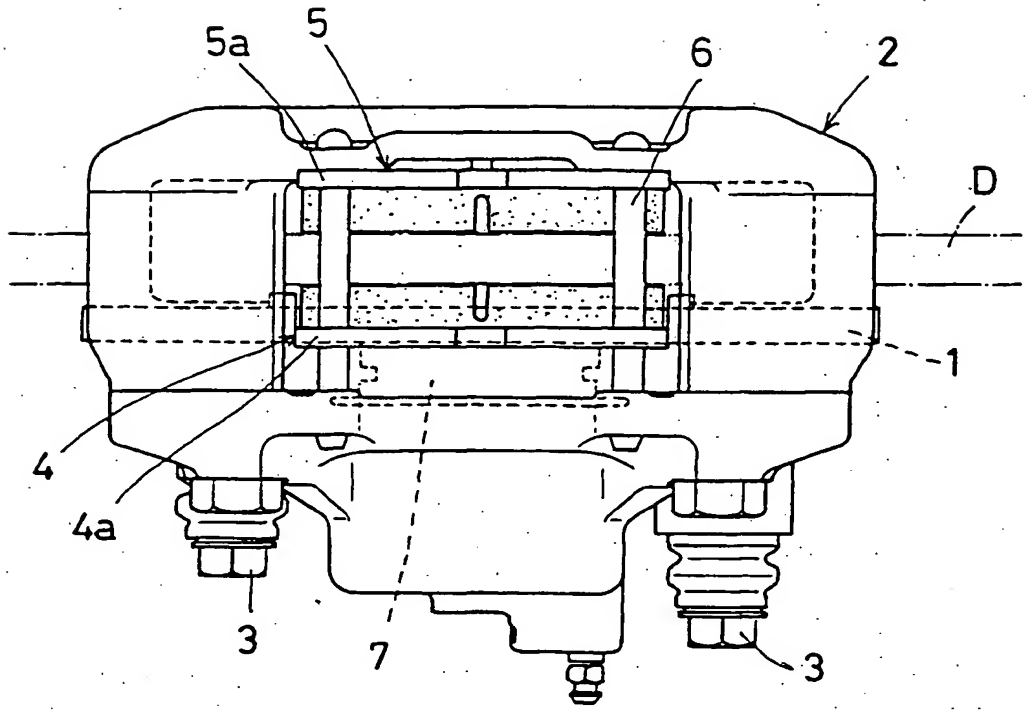

FIG. 1B